PT-2/HALF YEARLY EXAMINATION, 2022-23

PHYSICS

Time - 7:15 AM to 10:20 AM **Class - XI** **M.M. : 70**

Date – 09.09.2022 (Friday)

Name of the student ____ Section _____

General Instructions –

- There are 34 questions in all. All questions are compulsory.
- This question paper has four sections: Section A, Section B, Section C and Section D.
  - **Section A** contains sixteen questions of **one mark** each, **Section B** contains 1 case study question of **four mark**, **Section C** contains seven questions of **two marks** each, **Section D** contains seven questions of **three marks** each, **Section E** contains three questions of **Five marks** each,
- There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and in all questions of five marks. You have to attempt only one of the choices in such questions.

SECTION - A

Q 1. The displacement of a body is given as $s = t^3 - 6t^2$, the body is at rest at (1)

(a) T =2 sec (b) T = 4 sec (c) T = 8 sec (d) T = 6 sec

Q 2. A body is moving in a straight line, it's direction of motion is given by (1)

(a) Displacement (b) Acceleration (c) Velocity (d) All of these

Q 3. For a projectile fired from ground to ground, which of the following statement is false (1)

(a) It's horizontal component of velocity remains constant.

(b) It's vertical component of velocity varies with time.

(c) It's horizontal component of acceleration is always zero.

(d) It's vertical component of acceleration is always zero

Q 4. For a projectile motion from ground to ground, it's maximum height is equal to its horizontal range. It's angle of projection is (1)

(a) $\theta = \tan^{-1}(1/4)$ (b) $\theta = \tan^{-1}(4)$ (c) $\theta = \tan^{-1}(2)$ (d) $\theta = \tan^{-1}(1/2)$

Q 5. A boy moves 3m towards east, then he takes 90^0 left turn and moves 4m north. His displacement is (1)

(a) 5m, 53^0 east of north (b) 5m, 37^0 east of north

(c) 5m, 37^0 west of south (d) 5m, 53^0 west of south

Q 6. Which pair of the following forces will never give resultant force of 2N (1)

(a) 2N & 2N (b) 1N & 1N (c) 1N & 3N (d) 1N & 4N

Q 7. Which of the following is independent of choice of origin (1)

(a) Position vector (b) Displacement vector

(c) Both of above (d) Neither position vector nor displacement vector

Q 8. The angle which a vector $\hat{\imath} + \hat{\jmath} + \sqrt{2}\hat{k}$ makes with x, y & z axis (1)

(a) $60^0, 60^0, 60^0$ (b) $60^0, 60^0, 45^0$ (c) $30^0, 60^0, 45^0$ (d) None of these

Q 9. A body is moving in a circular path with constant speed v, what is change in velocity when the angle described at the centre of circle is ϴ (1)

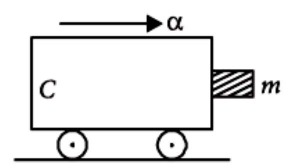
(a) 2v sin ϴ/2 (b) v sin ϴ/2 (c) v sin ϴ (d) 2v sin ϴ

Q 10. A particle is moving with constant speed in a circular path with constant angular velocity, then (1)

(a) It's centripetal acceleration is zero (b) It's tangential acceleration is zero

(c) It's net acceleration is zero (d) None of these

Q 11. A block of mass m is in contact with the cart C as shown in figure. The co-efficient of static friction between the block and cart is μ. The acceleration α of the cart that will prevent the block from falling satisfies (1)

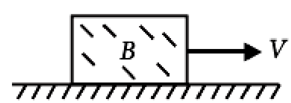


(a) $\alpha \geq \frac{mg}{\mu}$ (b) $\alpha \geq \frac{g}{\mu}$ (c) $\alpha \geq \frac{g}{m\mu}$ (d) $\alpha \leq \frac{g}{\mu}$

Q 12. A block has been placed on an inclined plane with slope angle ϴ, block slides down the plane at constant speed. The coefficient of kinetic friction is equal to (1)

(a) sin ϴ (b) cos ϴ (c) tan ϴ (d) g

Q 13. A block B is pushed momentarily along a horizontal surface with an initial velocity V. If μ is the coefficient of kinetic friction between B and the surface, block B will come to rest after a time (1)



(a) g μ / v (b) g/v (c) v/g (d) v / g μ

Q 14. **Assertion:** In projectile motion, path followed is a parabola because acceleration due to gravity near the surface of the earth remains constant. (1)

Reason: When acceleration of the particle is constant, then only possible path is parabola.

(*a*) If both assertion and reason are *correct* and reason is a *correct explanation* of the assertion.

(*b*) If both assertion and reason are *correct* but reason is *not the correct explanation* of assertion.

(*c*) If assertion is *correct* but reason is *incorrect*.

(*d*) If assertion is *incorrect* but reason is *correct*.

Q 15. **Assertion:** We cannot divide a vector quantity by another vector quantity. (1)

Reason: We can divide a vector quantity by a scalar quantity.

(*a*) If both assertion and reason are *correct* and reason is a *correct explanation* of the assertion.

(*b*) If both assertion and reason are *correct* but reason is *not the correct explanation* of assertion.

(*c*) If assertion is *correct* but reason is *incorrect*.

(*d*) If assertion is *incorrect* but reason is *correct*.

Q 16. **Assertion:** A ball is thrown vertically upwards and air resistance is considered. Time of ascent is less than the time of decent. (1)

Reason: Air resistance always acts opposite to velocity.

(*a*) If both assertion and reason are *correct* and reason is a *correct explanation* of the assertion.

(*b*) If both assertion and reason are *correct* but reason is *not the correct explanation* of assertion.

(*c*) If assertion is *correct* but reason is *incorrect*.

(*d*) If assertion is *incorrect* but reason is *correct*.

SECTION - B

Q 17. **Case Study Question: (read the passage given below and answer the Questions)** (4)

A block placed at the bottom of a rough inclined plane is projected up the plane with some initial speed. Coefficient of friction between block and the plane is μ. Block moves up the plane and comes to rest after time t_1.Then it again starts sliding down and reaches the bottom in further time t_2.

(i) Calculate retardation of block during upward motion.

(a) $g\sin\theta + \mu g\cos\theta$ (b) $g\sin\theta - \mu g\cos\theta$

(c) $g\cos\theta + \mu g\sin\theta$ (d) $g\cos\theta - \mu g\sin\theta$

(ii) Calculate acceleration during downward motion

(a) $g\sin\theta + \mu g\cos\theta$ (b) $g\sin\theta - \mu g\cos\theta$

(c) $g\cos\theta + \mu g\sin\theta$ (d) $g\cos\theta - \mu g\sin\theta$

(iii) Select the correct option.

(*a*) $t1 = t2$ (*b*) $t1 > t2$ (*c*) $t1 < t2$ (*d*) None of these

(iv)Calculate the normal force acting on the block

(a) $N = mg\cos\theta$ (b) $N = mg\sin\theta$ (c) $N = mg\tan\theta$ (d) $N = mg\cot\theta$

SECTION - C

Q 18. A car moves from X to Y with a uniform speed U and returns to X with a uniform speed V. What is the average speed for this round trip? (2)

Q 19. If the velocity of a particle is $v = At + Bt^2$ where A and B are constant, then what is the distance travelled by it between 1 s and 2 s. (2)

Q 20. If A $=\sqrt{5}$, B = 3 & $|\vec{A} \times \vec{B}| = 2\, \vec{A} \cdot \vec{B}$. Then find $|\vec{A} + \vec{B}|$ (2)

Q 21. An object is moving in a circular path with constant speed, Define the following terms (2)

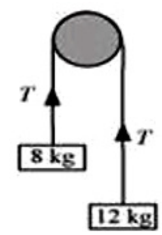
(a) Angular frequency (b) Time period

Q 22. A particle is projected with a velocity of 25 m/s at an angle of $30^0$with the horizontal. Calculate (2)

(*i*) the maximum height, (*ii*) time of flight

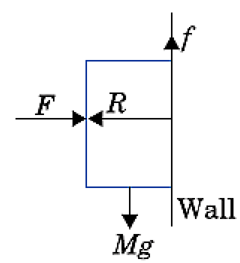
Q 23. For a particle in motion, the distance travelled by it is directly proportional to time. Find the external force acting on it? (2)

Q 24. Two masses 8 kg and 12 kg are connected at the two ends of a light in extensible string that goes over a frictionless pulley. Find the acceleration of the masses, and the tension in the string when the masses are released. (2)



OR

A block of mass *M* is held against a rough vertical wall by pressing it with a finger. If the coefficient of friction between the block and the wall is μ and the acceleration due to gravity is *g*, calculate the minimum force required to be applied by the finger to hold the block against the wall.



SECTION - D

Q 25. For an object under free fall, discuss the variation of acceleration with time, velocity with time and position of object with time graphically. (3)

Q 26. Derive a relation between (3)

(a) Linear displacement and Angular displacement

(b) Linear velocity and Angular velocity

Q 27. Give examples of multiplication of a vector by (*a*) a vector, (*b*) a scalar and (*c*) a real number. (3)

Q 28. (a) Show that the horizontal range is maximum when the angle of projection is 45^0. (3)

(b) Show that there are two angles of projection for which horizontal range is same.

OR

For two angles of projection, range(R) is same and vertical maximum heights are different H1 & H2 respectively. Establish a relation between H1 , H2 & R.

Q 29. State and prove law of conservation of linear momentum using Newton's third Law. (3)

Q 30. What will be the apparent weight of a person in a lift (3)

(a) when the lift is accelerating upwards?

(b) when the lift is accelerating downwards?

(c) when the lift is falling freely?

Q 31. (a) Discuss the variation of static friction, limiting friction, kinetic friction with the applied force with the help of a graph. (3)

(b) Define angle of repose.

SECTION - E

Q 32. (a) Write a short note on velocity and speed. Differentiate between them with the help of examples and illustrations. (5)

(b) If $x = t^2 - 6t^2 + 9t$, find the time interval in which the body is moving in negative x direction.

OR

Derive all the three equations of motion for an object in uniformly accelerated motion in one dimension

Q 33. State and explain triangle law of vector addition. Also find the magnitude and direction of resultant of two vectors. (5)

OR

Find the equation of trajectory, time of flight, maximum height and horizontal range of a projectile when projected at an angle Θ with the horizontal from the ground.

Q 34. (a) What do you mean by centripetal acceleration? Derive an expression for its magnitude and direction for a particle moving in a circular path. (5)

(b) What are the various types of acceleration involved in circular motion?

OR

What do you mean by banking of roads? Why is it needed? What is the safe velocity with which a vehicle can go round a curved smooth road banked at an angle?